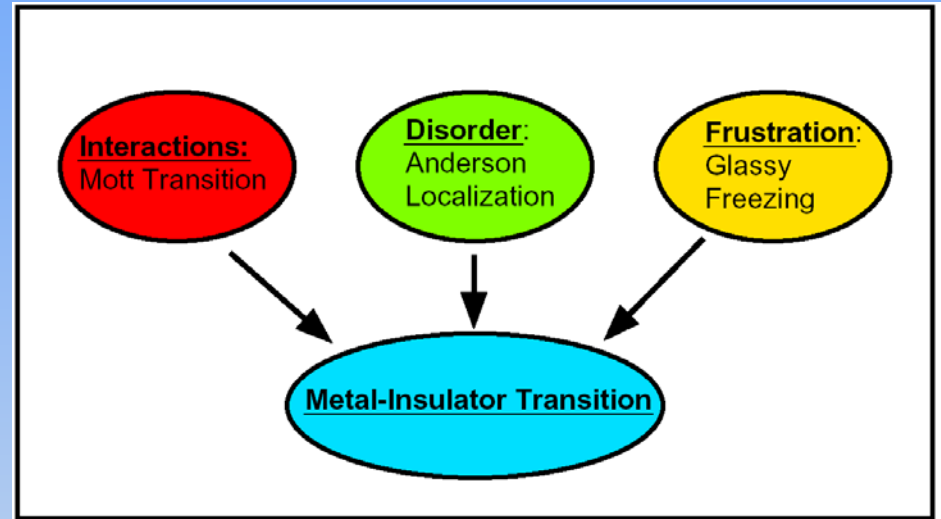


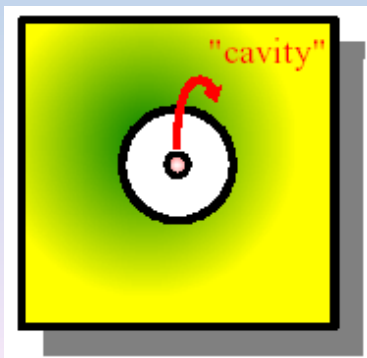
Dynamical Mean-Field Theory Approach to Interaction-Localization

Vladimir Dobrosavljevic, Florida State University, DMR-9974311

- **Technological revolution:** need to design and fabricate *new materials*.
- Need to understand conductors near metal-insulator transition
- **How conducting is a material?** What are the mechanisms for electron trapping (localization)?
- **Dynamical mean-field theory (DMFT):** a new theoretical approach that self-consistently calculates the **escape rate** of the electron from given site



Three physical processes in electron localization



- DMFT can incorporate all three elementary processes
- New picture of the metal-insulator transition
- Prediction: electronic Griffiths phase leading to non-Fermi liquid metallic behavior (seen in doped semiconductors, Kondo alloys)

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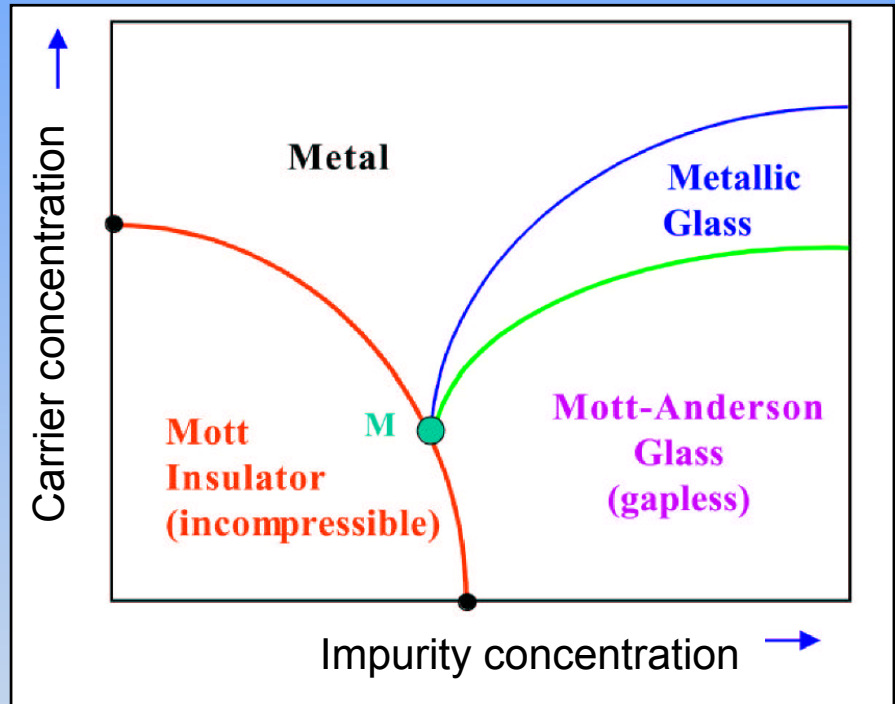
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Outreach activities:

- The PI presented lectures at elementary schools in order to popularize science and technology
- The PI acted as a Judge at Annual Regional Science Fairs for Middle School and High School students
- The PI participated in Physics Department Open House activities (demonstration “Physics of Paper Airplanes”)
- The PI participated in the NHMFL Annual Open House activities (demonstration “Physics of Behind Magnetism”)

Educational:

The PI partially supported three graduate students working on this project. One of them completed his Ph. D. degree in September 2001. These students received training in many-body theory, including computer modeling and analytical (diagrammatic and DMFT) calculations.



Phase diagram of disorder interacting electrons from “extended” DMFT (cond-mat/0206529). Metallic glassy behavior is predicted to precede the metal-insulator transition is sufficiently disordered samples. Very recently, these predictions have been experimentally confirmed in silicon metal-oxide-semiconductor field-effects transistors .